Inventory investment, global engagement, and financial constraints in the UK: evidence from micro data

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Abstract

We use a panel of 9381 UK firms to study the links between firms' global engagement status and their financial health. We estimate inventory investment equations augmented with a financial composition variable, and interpret the sensitivity of inventory investment to the latter as a measure of the strength of the financial constraints faced by firms. We find that smaller, younger, and more risky firms; and firms that do not export and are not foreign owned exhibit higher sensitivities. Moreover, global engagement substantially reduces the sensitivities displayed by the former categories of firms: this suggests that it shields firms from financial constraints.

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1. Introduction

A burgeoning literature has documented that, in an increasingly globalized world, exporters and foreign owned firms are larger, more productive, more capital-intensive, and pay higher wages than their purely domestic counterparts[1]. Yet, the effects of being an exporter or foreign owned on other firm characteristics have received much less attention. This paper seeks to fill this gap in the literature, by using a large panel of UK firms to study whether the two dimensions of firms' global participation, namely export behavior and foreign ownership, affect firms' financial health.

Only a handful of papers in the literature have looked at the effects of global engagement on firms' financial health, obtaining contrasting results. Along the first dimension of global participation, Campa and Shaver (2002) find that liquidity constraints are less binding for Spanish exporters compared to non-exporters; while Castañeda (2002) shows that export-oriented Mexican firms faced higher financial constraints before the 1995-2000 financial paralysis than after. Along the second dimension, and focusing respectively on Colombia, Côte D'Ivoire, and Estonia, Arbeláez and Echavarría (2002), Harrison and McMillan (2003), and Mickiewicz et al. (2004) show that foreign owned firms face lower financial constraints compared to other firms. De Brun et al. (2002) find no such evidence for firms in Uruguay[2].

All the above mentioned papers analyze financial constraints in the context of fixed investment regressions augmented with financial variables such as cash flow. In particular, they consider the sensitivity of investment to cash flow as an indicator of the degree of financial constraints faced by firms: financially constrained firms (for whom access to external finance is difficult and/or expensive) can only invest if they have sufficient internal funds.

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[1] See Greenaway and Kneller (2007) for a survey on firm level adjustment to globalization.

[2] Related studies are Desai et al. (2008), who find that internal capital markets of multinational firms allow their affiliates to expand output after severe depreciations, when economies are fragile and prone to economic contractions; Blalock et al. (2008), who show that following the 1997 East Asian financial crisis which led to a dramatic currency devaluation, it was only those Indonesian exporters with foreign ownership who were able to increase investment significantly, while domestic firms were unable to do so due to financing constraints; and Harrison et al. (2004), who find that direct foreign investment is associated with a reduction of financing constraints for firms without foreign assets and for domestically owned enterprises.

Our contribution to the literature is twofold. First, we study the effects of global engagement on firms' financial health in the UK. This is important because most of the studies that looked at similar issues generally considered developing or transition countries. Our choice of the UK is motivated by the fact that this country ranks high in terms of global engagement: it is the fifth largest exporter of manufactures in the world and the second largest host of multinational enterprises. Moreover, a rich firm-level dataset is available for the UK, that covers mostly unlisted firms, which are generally small, young, and particularly likely to face financial constraints.

We expect globally engaged firms to face a lower degree of financial constraints compared to their purely domestic counterparts for the following reasons. First, globally engaged firms have access to both internal and international financial markets, which enables them to diversify their sources of financing and the associated risks. Specifically, foreign owned firms can obtain credit from their parent company, insuring themselves against liquidity constraints (Desai et al., 2004)[3]. Second, as they benefit from a lower bankruptcy risk and adopt international standards faster in terms of product quality, foreign owned firms find it easier to gain access to domestic banks (Colombo, 2001; Harrison and McMillan, 2003). Third, because they are also dependent on demand from foreign countries, exporters are less tied to the domestic cycle, and less subject to those financial constraints caused by tight monetary policy and recessions at home[4]. This leads to a more stable cash flow for exporters compared to non-exporters, which in turn leads to weaker liquidity constraints (Campa and Shaver, 2002; Garcia-Vega and Guariglia, 2008)[5]. Finally, being an exporter also provides a signal that the firm is sufficiently productive to generate enough profits in foreign markets to recover the sunk costs that need to be met when entering foreign markets for the first time (Roberts and Tybout, 1997). This increases the likelihood that the firm will be able to service its external debt, and further relaxes the liquidity constraints that it faces.

[3] In a purely domestic framework, Hoshi et al. (1991) and Ng and Schaller (1996) consider firms belonging to groups as less likely to face financing constraints.
[4] This argument relies on the assumption that business cycles are not perfectly coordinated across countries.
[5] A more stable cash flow provides in fact greater assurances to lenders that the firm will be able to service its obligations.

Our second contribution to the literature is that we explore, for the first time, the links between firms' global engagement and their financial health in the context of inventory investment regressions. We estimate error-correction inventory investment equations augmented with a financial composition variable. As in the investment literature, we interpret the coefficient on the latter as measures of the degree of financial constraints faced by firms. We explore how these coefficients differ across firms classified into financially constrained and unconstrained in a traditional sense (based in turn on size, age, and risk), on the one hand; and across globally engaged and purely domestic, on the other. We also compare the coefficients across globally engaged financially constrained firms and purely domestic financially constrained firms, with the objective of determining whether global engagement can shield firms from financial constraints.

Three reasons justify our choice of inventory investment in our analysis. First, because of its high liquidity and low adjustment costs, inventory investment is likely to be more sensitive to financial variables than investment in fixed capital (Carpenter et al., 1994). Second, inventory investment plays a crucial role in business cycle fluctuations (Blinder and Maccini, 1991). Third, inventory investment equations are less likely than fixed investment equations to suffer from misspecification due to the inappropriate control for investment opportunities[6].

Our results show that smaller, younger, and more risky firms, on the one hand; and firms that are not globally engaged, on the other, exhibit higher sensitivities of inventory investment to our financial composition variable. Moreover, when we differentiate among purely domestic financially constrained firms, globally engaged financially constrained firms, and financially unconstrained firms, we find that the effects of our financial variable are statistically significant only for the former group, implying that global engagement helps firms to overcome liquidity constraints.

The remainder of this paper is organized as follows. Section 2 presents some economic background for our analysis, and illustrates our baseline specification and our

[6] Within a *Q* model of investment framework, Cummins et al. (2006) show that financial variables such as cash flow could enter significantly in an investment regression simply because they pick up investment opportunities which are not properly accounted for by Tobin's *Q*.

econometric methodology. In Section 3, we describe our data and present some descriptive statistics. Section 4 illustrates our main empirical results, and Section 5 concludes.

2. Economic background, baseline specification, and estimation methodology

Economic background

Our baseline specification is motivated by a generalization of Kashyap et al.'s (1993) framework, which focuses on financial composition and its effects on firms' real activities. Kashyap et al. (1993) assume that firms can finance their investment projects in two ways: either by using bank loans or by issuing commercial paper. To measure financial composition, they introduce a "mix" variable, defined as the ratio of bank loans to the sum of bank loans and commercial paper. They show that the "mix" is an important determinant of both inventory investment and investment in fixed capital. In other words, the availability of bank credit has a positive impact on fixed capital and inventory accumulation, as firms cannot perfectly substitute bank loans with commercial paper.

Because, in the UK, the commercial paper market is not particularly developed, we consider another leading short-term substitute for bank loans, namely trade credit. Specifically, we use an alternative "mix" variable (labelled *MIX*), defined as the ratio of the firm's short-term debt to the sum of its short-term debt and trade credit, where short-term debt is essentially made up of bank loans, and trade credit is a form of financing automatically created when customers delay payment of their bills to their suppliers.

The inclusion of trade credit in our "mix" variable is motivated by the fact that this form of financing is widely used[7]. For instance, Rajan and Zingales (1995) document that in 1991, funds loaned to customers represented 17.8% of total assets for US firms, 22% for UK firms, and more than 25% for countries such as Italy, France, and Germany. Similarly, according to Kohler et al. (2000), 55% of the total short-term credit received by UK firms during the period 1983-95 took the form of trade credit. As suppliers can closely monitor

[7] Kashyap et al. (1993) themselves acknowledge the importance of considering trade credit as a short-term substitute for bank credit (footnote 19, p. 88). Yet, they are unable to use it in their empirical analysis, which is based on aggregate data.

their clients during the normal course of business, trade credit is available to most firms[8]. Yet, it is typically more expensive than bank credit, as customers generally do not use the early payment discount (Petersen and Rajan, 1997)[9].

In summary, bank lending is generally available to most firms at a reasonable cost, while trade credit is also widely available, but much more expensive. Consequently, especially for those firms more likely to face financing constraints, these two forms of financing are not perfect substitutes, and the proportion of financing that they obtain from banks is likely to affect their activities.

As in Kashyap et al. (1993), Hoshi et al. (1993), and Huang (2003), we include our *MIX* variable in inventory investment regressions. We then examine whether the effect of this variable on inventory investment differs across firms a priori more and less likely to face financial constraints in a traditional sense; and across globally engaged and purely domestic firms. We interpret the sensitivity of inventory investment to *MIX* displayed by our firms as a measure of the strength of the financial constraints that they face[10]. A strong positive association between inventory accumulation and *MIX* indicates that having easy access to cheaper and more widely available bank finance facilitates inventory investment, probably because trade credit is too expensive for some firms. We expect the association to be stronger for firms a priori more likely to face financing constraints in a traditional sense, and for purely domestic firms[11].

[8] According to Elliehausen and Wolken (1993), more than 80% of the US firms covered in the National Survey of Small Business Finances used trade credit in 1987.

[9] A common form of trade credit contract is known as the “2/10 net 30” type. “2/10” means that the buyer gets a 2% discount for payment within 10 days. “Net 30” means that full payment is due 30 days after the invoice date. After that date, the customer is in default. The combination of a 2% discount for payment within 10 days and a net period ending on day 30 defines an implicit interest rate of 43.9%, which can be seen as the opportunity cost to the buyer to forgo the discount in exchange for 20 additional days of financing (Petersen and Rajan, 1997).

[10] Contrary to Kashyap et al. (1993), Hoshi et al. (1993), and Huang (2003), we do not analyze how *MIX* (or the sensitivity of inventory investment to this variable) behaves in periods of recession and/or tight monetary policy. This is because our data set spans the years 1993-2003, which was a recession-free period in the UK.

[11] All our results were robust to using a broader “mix” variable defined as the ratio of the firm’s short-term debt to its total current liabilities (which include corporate bonds, commercial paper, and loans from finance and insurance companies, in addition to bank loans and trade credit).

Baseline specification

The baseline specification that we use is a variant of Lovell's target adjustment model (1961). Denoting with *I* and *S* the logarithms of inventories and sales, the equation for inventory growth that we initially estimate takes the following form:

$$\Delta I_{it} = \alpha + \beta_0 \Delta I_{i,t-1} + \beta_1 \Delta S_{it} + \beta_2 \Delta S_{i,t-1} + \beta_3 (I_{i,t-1} - S_{i,t-1}) + \beta_4 MIX_{it} + v_i + v_t + v_{jt} + e_{it} \quad (1)$$

The subscript *i* indexes firms; *j*, industries; and *t*, time, where *t*=1995-2003. Differences of the logarithms of sales and inventories are included in the regression to capture the short-run dynamics. The term ($I_{i,t-1} - S_{i,t-1}$) can be interpreted as reflecting the influence of a long-run target inventory level. This gives the specification an error-correction format. Error-correction behavior enters the empirical framework because of adjustment costs. In their presence, the firm will not immediately adjust its inventory stock to the target level, which is assumed to be a function of sales. We specify a dynamic adjustment mechanism between *I* and *S* (the details of which are contained in Appendix 1). To be consistent with error-correction behavior, the coefficient associated with the term ($I_{i,t-1}$ - $S_{i,t-1}$) should be negative: if the stock of inventories (*I*) is lower (higher) than the target (*S*), then future inventory investment should be higher (lower).

MIX denotes our financial composition variable[12]. We interpret the coefficients associated with this variable as a measure of the strength of the financial constraints faced by our firms. Specifically, we explore how these coefficients differ across firms classified into financially constrained and unconstrained in a traditional sense (based in turn on size, age, and risk), on the one hand; and across globally engaged and purely domestic, on the other. In order to determine whether global engagement plays a role in shielding firms from financial constraints, we compare the coefficients across globally engaged financially constrained firms and purely domestic financially constrained firms[13].

[12] *MIX* is evaluated at time *t*. This can be motivated by the fact that inventory investment has low adjustment costs, and can therefore quickly react to changes in financial variables (Carpenter et al., 1994, 1998).

[13] Other studies that estimated reduced-form inventory investment equations considered the sensitivity of inventory investment to cash flow as an indicator of the degree of financial constraints faced by firms (Benito,

The error term in Equation (1) is made up of four components: v_i, which is a firm-specific component; v_t, a time-specific component accounting for possible business cycle effects, and more specifically for effects due to changes in interest rates; v_{jt}, a time-specific component which varies across industries accounting for industry-specific shifts in inventory investment demand; and e_{it}, an idiosyncratic component. We control for v_i by estimating our equation in first-differences; for v_t by including time dummies; and for v_{jt} by including industry dummies interacted with time dummies in all our specifications[14].

Estimation methodology

All equations are estimated in first-differences, to control for firm-specific, time-invariant effects. Given the possible endogeneity of the regressors, we use a first-difference Generalized Method of Moments (GMM) approach[15]. Two or more lags of each of the regressors are used as instruments.

To check whether the first-difference GMM estimator is likely to suffer from finite sample bias, we compared the GMM and the Within Groups estimates of the coefficient on the lagged dependent variable in Equation (1). Because the Within Groups estimate is typically downward biased in short panels (Nickell, 1981), one would expect a consistent estimate of the coefficient on the lagged dependent variable to lie above this estimate. As our GMM coefficient was larger than its Within Groups counterpart, we concluded that the first-difference GMM estimates are unlikely to be subject to serious finite sample bias[16].

2005; Carpenter et al., 1994, 1998; and Guariglia, 1999). Cash flow is often negative in our dataset. This is because our dataset includes a number of very small firms, which are typically very young, and possibly start-up firms. As a negative cash flow cannot really be interpreted as a measure of the availability of internal funds to the firm, or of the healthiness of the firm's balance sheet, we preferred not to use this variable in our main specifications. Nevertheless, in Section 4, we check the robustness of our results to adding the cash flow to tangible fixed assets ratio to equation (1).

[14] Firms are allocated to one of the following nine industrial sectors: metals and metal goods; other minerals, and mineral products; chemicals and man made fibres; mechanical engineering; electrical and instrument engineering; motor vehicles and parts, other transport equipment; food, drink, and tobacco; textiles, clothing, leather, and footwear; and others (Blundell et al., 1992). Including industry-level time dummies in our regressions ensures that the results aimed at differentiating between globally engaged and purely domestic firms are not simply due to cross-industry variations.

[15] See Arellano and Bond (1991) on the application of the GMM approach to panel data. The command xtabond2 devised by D. Roodman (2005) in Stata (version 9.2) is used in estimation.

[16] If the estimates obtained using the first-difference GMM estimator lie close or below the Within Groups estimates, one could suspect the GMM estimate to be downward biased as well, possibly due to weak

In order to evaluate whether our model is correctly specified, we use two criteria: the Sargan test (also known as *J* test) and the test for second-order serial correlation of the residuals in the differenced equation (*m2*). If the model is correctly specified, the variables in the instrument set should be uncorrelated with the error term in the relevant equation. The *J* test is the Sargan test for overidentifying restrictions, which, under the null of instrument validity, is asymptotically distributed as a chi-square with degrees of freedom equal to the number of instruments less the number of parameters. The *m2* test is asymptotically distributed as a standard normal under the null of no second-order serial correlation of the differenced residuals, and provides a further check on the specification of the model and on the legitimacy of variables dated *t*-2 as instruments in the differenced equation[17].

3. Main features of the data and summary statistics

The dataset

Our dataset is derived from the profit and loss and balance sheet data gathered by Bureau Van Dijk Electronic Publishing in the *Financial Analysis Made Easy* (*FAME*) database. The database provides information on companies over the period 1993-2003[18]. Over 99% of the firms included in the dataset are not traded on the stock market, or are quoted on alternative exchanges such as the Alternative Investment Market (*AIM*) and the Off-Exchange (*OFEX*) market[19]. Unquoted firms are more likely to be characterized by adverse financial attributes such as poor solvency, a short track record, and low real assets compared to quoted firms, which are typically large, long-established, financially solid companies with good credit ratings. Our data allows us therefore to find proxies for

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instruments. In such case, the use of a GMM system estimator (which combines in a system the original specification expressed in first differences and in levels) would be required (Blundell and Bond, 1998).

[17] If the undifferenced error terms are *i.i.d.*, then the differenced residuals should display first-order, but not second-order serial correlation. In our Tables, we report both the test for first-order (*m1*) and the test for second-order (*m2*) serial correlation of the differenced residuals. Note that neither the *J* test nor the *m2* test allow to discriminate between bad instruments and model specification.

[18] A maximum of ten years of complete data history can be downloaded at once. Our data were downloaded early in 2004: the coverage period is therefore 1993-2003.

[19] We only selected firms that have unconsolidated accounts: this ensures that the majority of the firms in our dataset are relatively small. Moreover, it avoids the double counting of firms belonging to groups, which would be included in the dataset if firms with consolidated accounts were also part of it.

financial constraints, characterized by a wide range of variation across observations in the sample. This allows us to perform sharper tests for the existence of financing constraints than those performed in the inventory investment literature, where datasets made up only of quoted firms were generally used (Carpenter et al., 1994, 1998; Guariglia, 1999; Huang, 2003 etc.).

The firms in our dataset operate in the manufacturing sector. We excluded companies that changed the date of their accounting year-end by more than a few weeks, so that the data refer to twelve month accounting periods. Firms that did not have complete records on total inventories, sales, and *MIX* were also dropped. Finally, to control for the potential influence of outliers, we excluded observations in the one percent tails for each of the regression variables.

The panel used in our analysis includes therefore a total of 40949 annual observations on 9381 companies, covering the years 1993-2003. It has an unbalanced structure, with the number of years of observations on each firm varying between three and eleven[20]. By allowing for both entry and exit, the use of an unbalanced panel partially mitigates potential selection and survivor bias.

Sample separation criteria

In order to evaluate whether the sensitivity of inventory investment to our financial composition variable differs at different groups of firms, we use two groups of sample separation criteria. The first group of criteria is aimed at classifying firms into financially constrained and financially unconstrained, and is based in turn on three traditionally used firm characteristics: size, age, and risk. We measure firm size using, alternatively, firm sales and its number of employees. Smaller and younger firms are susceptible to information asymmetry effects, since little public information is available for them, and it is difficult for financial institutions to gather this information. Obtaining external finance is

[20] See Appendix 2 for more information on the structure of our panel and complete definitions of all variables used. Since a number of regressors are lagged once and since we estimate our equations in first differences, the dataset actually used in estimation only covers the years 1995-2003.

therefore likely to be particularly difficult and/or costly for them (Bernanke and Gertler, 1995)[21].

Similar considerations apply to risky firms. Our dataset includes a variable measuring the firm's risk (labelled "*Quiscore*"), which is based on information about the credit ratings of the firm. It is an indicator which measures the likelihood of company failure in the twelve months following the date of calculation. The lower its *Quiscore* value, the more risky a firm is considered. This is a wider definition of perceived financial health than the commonly used bond rating, which only applies to a small fraction of rated firms (Whited, 1992; Kashyap and Stein, 1994).

We consider the situation of each firm relative to that of other firms in the industry in which that firm operates. For example, when using firm size measured by sales as a sample separation criterion, we define as financially constrained within an industry in a given year those observations with total sales in the bottom three quartiles of the distribution of the sales of all the firms in that particular industry and year.[22] A similar procedure is used when observations are classified as financially constrained on the basis of their number of employees, age, or *Quiscore*. In this way, we allow firms to transit between classes. Our empirical analysis will hence focus on firm-years rather than simply firms. We expect firm-years that are financially constrained in a traditional sense to display higher sensitivities of inventory investment to our financial variable.

Our second group of criteria is based on global engagement variables. In particular, we consider as globally engaged those firms that export, or are foreign owned. Because they have access to both internal and international markets, are less tied to the domestic business cycle, and have been able to afford the sunk costs necessary to enter export markets, we expect globally engaged firms to face a lower degree of financial constraints

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[21] Note that a financially constrained firm is not necessarily financially distressed. Firms that face constraints at the margin could in fact be dynamic, fast-growing enterprises that exhaust their supply of cheap sources of funds, and hence need large amounts of external finance.

[22] Classifying firms in the bottom three quartiles of the distribution of sales, number of employees, age, or *Quiscore* as financially constrained is motivated by the fact that our sample is mainly made up of unquoted firms, and contains a majority of relatively small firms with short track records, which are highly likely to face financing constraints. All our results were robust to using 70% or 80% as alternative cut-off points.

compared to their purely domestic counterparts, and therefore to exhibit lower sensitivities of inventory investment to our financial composition variable.

Summary statistics

Descriptive statistics relative to our entire sample and various sub-samples of firm-years are presented in Table 1. Column 1 refers to the entire sample, columns 2 to 9 to the sub-samples of financially constrained and unconstrained firm-years defined on the basis of traditional criteria; and columns 10 to 13 to the sub-samples defined on the basis of the global engagement criteria[23].

We can see that on average 74.4% of the firm-years in our sample participate in export markets, and that 46.2% of them are foreign owned: this indicates that global engagement is quite pervasive in our sample.

It appears that firm-years with high sales and older firm-years are also larger in terms of asset size and employment. Similarly, firm-years characterized by positive exports are typically larger than firm-years that do not export. Relatively risky and relatively safe, and foreign owned versus purely domestic firm-years do not differ too much in terms of asset size and number of employees.

Focusing on our financial composition variable, we can see that the average value of *MIX* is 0.51. This indicates that bank lending constitutes more than half of the firm's short term finance. Furthermore, *MIX* is higher for more risky, larger, as well as for globally engaged firm-years. The difference in the average values of this financial variable is particularly pronounced between relatively risky and safe firm-years. This suggests that highly bank-dependent firms are more at risk from bankruptcy compared to other firms: these firms are therefore more likely to face financial constraints. Yet, the fact that *MIX* is higher for larger firms suggests that a high bank-dependence can also be associated with good financial health. However, what really points to financial constraints is not the

[23] Note that the global engagement variables are characterized by a number of missing values. This is due to the fact that not all firms are required to report their export turnover, and/or whether they are foreign owned.

magnitude of *MIX*, but the effect that this variable has on firms' inventory accumulation. The next section formally investigates this link.

4. Empirical results

The estimates of Equation (1) are reported in the first column of Table 2[24]. Lagged inventory investment attracts a negative and precisely determined coefficient; both current and lagged sales growth affect inventory investment positively; and the coefficient on the error correction term is negative and precisely determined. Moreover, the coefficient on the *MIX* variable is positive and statistically significant. This indicates that the higher the proportion of bank credit used by firms relative to trade credit, the more the firm can invest in inventories. More specifically, if *MIX* increased by one standard deviation, inventory investment would rise by 5.2%. This effect, which is consistent with the findings in Kashyap et al. (1993) and Hoshi et al. (1993), is economically significant.

In column 2 of Table 2, we test whether our results are robust to including the ratio of cash flow to tangible fixed assets as an additional regressor in our specification[25]. This exercise is motivated by the fact that a number of authors (Carpenter and Petersen, 1994, 1998; Guariglia, 1999; Benito, 2005) have found that cash flow is a significant determinant of inventory investment. We can see that adding the ratio of cash flow to tangible fixed assets to our equation leads to a larger coefficient associated with *MIX*. This confirms that having access to bank finance is important for inventory investment.

Yet, the cash flow ratio has an insignificant impact on inventory investment. This could be explained considering the contrasting effects that cash flow may have on inventory investment. On the one hand, when demand increases, cash flow increases, but firms may need to reduce their stocks of inventories to satisfy the increased demand. This may lead to a negative relationship between inventory investment and cash flow. On the other hand, firms with higher cash flow can afford to increase their stocks of inventories, implying a

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[24] We report first-stage GMM estimates, which according to Arellano and Bond (1991), are likely to have better small-sample properties. The two-step estimates were, however, very similar.

[25] For the reasons discussed in footnote 13, we drop from our sample firms with more than three consecutive years of negative cash flow. This explains the lower number of observations in column 2 of Table 2 compared to column 1.

positive inventory investment - cash flow relationship. If of similar magnitudes, these two opposing effects could offset each other, leading to an insignificant cash flow coefficient. Another reason why our cash flow variable may attract a poorly determined coefficient is that cash flow and sales may be highly collinear, making it difficult to estimate the relevant coefficients (Bagliano and Sembenelli, 2004)[26]. In both columns of Table 2, neither the Sargan nor the *m2* test indicate any problems with the choice of instruments or the general specification of the model.

We next estimate the following specification, in which the effects of *MIX* are differentiated across firm-years more and less likely to face financial constraints in a traditional sense:

$$\begin{aligned}\Delta I_{it} &= \alpha + \beta_0 \Delta I_{i,t-1} + \beta_1 \Delta S_{it} + \beta_2 \Delta S_{i,t-1} + \beta_3 (I_{i,t-1} - S_{i,t-1}) + \\ &\quad + \beta_{41} MIX_{it} * CONS_{it} + \beta_{42} MIX_{it} * (1 - CONS_{it}) + v_i + v_t + v_{jt} + e_{it}\end{aligned} \tag{2}$$

$CONS_{it}$ is a dummy variable equal to 1 if firm *i* is financially constrained at time *t*, and equal to 0 otherwise[27].

Table 3 presents the estimates of Equation (2). In columns 1 to 4, traditional financial constraints are measured respectively on the basis of the firms' sales, number of employees, age, and credit risk. We can see that in all cases, the coefficients associated with *MIX* are statistically significant only for constrained firm-years. This result is in line with Carpenter et al. (1994, 1998), Guariglia (1999), and Benito (2005).

[26] Given the insignificance of the cash flow coefficient, in the Tables that follow we only report the results based on *MIX*. All our results were robust to including cash flow as an additional regressor. These results are not reported for brevity, but are available on request.

[27] We prefer to use interaction terms rather than splitting the sample into sub-groups of firms and estimating separate regressions for each of the sub-groups, as this enables us to avoid problems of endogenous sample selection, to gain degrees of freedom, and to take into consideration the fact that firms can transit between groups. See Kaplan and Zingales (1997) for a similar approach. All our results were, however, robust to estimating separate regressions on separate sub-samples of firms defined as financially constrained/unconstrained on the one hand, and globally engaged/purely domestic on the other, on the basis of the average of the chosen sample separation variable taken over the entire sample, or over the first three years of data. These results are not reported for brevity, but are available on request.

Our next specification looks at whether, compared to their purely domestic counterparts, globally engaged firms display lower sensitivities of inventory investment to *MIX*. The Equation that we estimate for this purpose takes the following form:

$$\begin{aligned}\Delta I_{it} = \alpha + \beta_0 \Delta I_{i,t-1} + \beta_1 \Delta S_{it} + \beta_2 \Delta S_{i,t-1} + \beta_3 (I_{i,t-1} - S_{i,t-1}) + \\ + \beta_{41} MIX_{it} * (1 - GE_{it}) + \beta_{42} MIX_{it} * GE_{it} + v_i + v_t + v_{jt} + e_{it}\end{aligned} \tag{3}$$

where GE_{it} is a dummy variable equal to 1 if firm *i* has positive exports in year *t* and/or is foreign owned in year *t*, and 0 otherwise.

Our estimates of Equation (3) are presented in Table 4. Column 1 refers to the case in which global engagement is measured on the basis of whether the firm exports, and column 2 to the case in which it is measured on the basis of whether the firm is foreign owned. It appears that *MIX* has a significant coefficient only for purely domestic firms. These results are in line with Arbeláez and Echavarría (2002), Campa and Shaver (2002), Harrison and McMillan (2003), and Mickiewicz et al. (2004), and suggest that both dimensions of global engagement are associated with a lower degree of financial constraints.

Finally, pushing our analysis one step further, we propose a direct test for whether global engagement reduces the severity of the liquidity constraints that financially constrained firms may face. More specifically, we test whether the sensitivity of inventory investment to our *MIX* variable is lower for those financially constrained firms that are globally engaged compared to their domestic counterparts. We estimate the following Equation:

$$\begin{aligned}\Delta I_{it} = \alpha + \beta_0 \Delta I_{i,t-1} + \beta_1 \Delta S_{it} + \beta_2 \Delta S_{i,t-1} + \beta_3 (I_{i,t-1} - S_{i,t-1}) + \\ + \beta_{411} MIX_{it} * CONS_{it} * (1 - GE_{it}) + \beta_{412} MIX_{it} * CONS_{it} * GE_{it} + \\ + \beta_{42} MIX_{it} * (1 - CONS_{it}) + v_i + v_t + v_{jt} + e_{it}\end{aligned} \tag{4}$$

Table 5 presents the estimates of Equation (4) when global engagement is measured in terms of export behavior. As in Table 3, in columns 1 to 4, firm-years are split into financially constrained and unconstrained in a traditional sense, using respectively firms' sales, number of employees, age, and credit risk as sorting criteria. We can see that *MIX* only affects inventory investment at those financially constrained firm-years that do not export, suggesting therefore that serving foreign as well as domestic markets plays an important role in dampening the effects of liquidity constraints for small, young, and more risky firms. Finally, the *J* and *m2* tests do not indicate any problems with the specification of the model and the choice of the instruments.

We perform a similar exercise using foreign ownership as a measure of global engagement. It appears that only those financially constrained firm-years that are purely domestic display a positive sensitivity of inventory investment to our financial composition variable. So, just like serving foreign markets through exports, being foreign owned reduces the severity of the financial constraints that a firm faces. These results are not reported for brevity but are available on request.

5. Conclusions

We have used a panel of 9381 UK firms over the period 1993-2003 to study the links between firms' global engagement status and their financial health. We have estimated error-correction inventory investment equations augmented with a financial composition variable, *MIX*, defined as the firm's ratio of short-term debt to short-term debt plus trade credit. We have then analyzed the differential effects of *MIX* on the inventory accumulation of firms more and less likely to face financial constraints in a traditional sense, on the one hand; and of globally engaged versus purely domestic firms, on the other.

In line with previous studies, our results suggest that *MIX* only affects inventory investment at firms that are financially constrained in a traditional sense (i.e. small, young, and risky firms). Moving beyond existing literature, we also found that inventory accumulation at globally engaged firms is not sensitive to *MIX*, whereas inventory investment at purely domestic firms is. This suggests that global engagement is associated with a lower degree of financial constraints.

Finally, we have directly tested whether global engagement plays a role in attenuating the liquidity constraints faced by smaller, younger, and more risky firms. For this purpose we have analysed the effects of *MIX* on the inventory investment of purely domestic financially constrained firms, globally engaged financially constrained firms, and financially unconstrained firms. We found that our financial variable only has a statistically significant effect on the inventory investment of the former category. We interpreted this as evidence that global engagement shields firms from liquidity constraints.

From a policy viewpoint, these results suggest that export promotion policies and policies providing incentives to Foreign Direct Investment (FDI) may be beneficial to the economy, not only through their well-known direct growth-enhancing role, but also because they are likely to reduce the level of financial constraints faced by firms, and consequently to indirectly enhance their investment spending and productivity. The latter effect is particularly relevant for small and medium-sized enterprises (SMEs), whose investment is often constrained by the lack of finance.

Appendix 1: The error-correction inventory model

The baseline error-correction specification which is estimated (Equation 1) can be seen as a generalization of Lovell's target adjustment model (1961). The target-adjustment model is based on the hypothesis that each firm has a desired target level of inventories, and that a firm finding its actual level of inventories different from its target level attempts only a partial adjustment towards the target level within any one period. As discussed in Lovel (1961, pp. 295-296), this partial adjustment could be due to the fact that there are costs involved in changing the level of stocks. Moreover, there could be problems related with the heterogeneous nature of stocks and/or the infrequent intervals at which certain goods are ordered.

We assume that the target stock of inventories of firm *i* at time *t* (I_{it}^{*}) is related to the volume of sales in that period (S_{it}) via the following Equation, where the variables are expressed in logarithms:

$$I_{it}^{*} = \alpha + \beta S_{it} \qquad \text{(A1)}$$

β is the marginal desired stock coefficient, which can also be seen as an accelerator effect: if sales are expected to increase, then the target stock of inventories will also increase.

Denoting the logarithm of the actual stock of inventories of firm *i* at time *t* with I_{it}, and assuming that the actual inventory investment ΔI_{it} is a fraction δ of the required investment necessary for the firm to adjust its stocks to the equilibrium level, we can write

$$\Delta I_{it} = I_{it} - I_{i,t-1} = \delta (I_{it}^{*} - I_{i,t-1}) = \delta\alpha + \delta\beta S_{it} - \delta I_{i,t-1} \qquad \text{(A2)}$$

This yields:

$$I_{it} = \delta\alpha + \delta\beta S_{it} + (1-\delta) I_{i,t-1} \qquad \text{(A3)}$$

We then nest Equation (A3) within a general dynamic regression model, which accounts for the slow adjustment of the actual stock of inventories to the desired stock. We consider an autoregressive distributed lag specification with up to second-order dynamics (i.e. an ADL(2,2) model). This leads to:

$$I_{it} = \beta_1 I_{i,t-1} + \beta_2 I_{i,t-2} + \beta_3 S_{it} + \beta_4 S_{i,t-1} + \beta_5 S_{i,t-2} + v_i + v_{jt} + v_t + e_{it} \qquad \text{(A4)}$$

The presence of lagged variables makes allowance for the fact that data are not observed in a state of equilibrium. We include a firm-specific effect (v_i), an industry-specific time effect (v_{jt}), and a regular time-specific effect (v_t). Together with the idiosyncratic component, e_{it}, these make up the error term of Equation (A4). We also impose the parameter restriction $(\beta_3 + \beta_4 + \beta_5)/(1 - \beta_1 - \beta_2) = 1$, aimed at ensuring a long-run equilibrium behavior of the stock of inventories relative to sales. Imposing this long-run unit elasticity and reparameterizing the ADL model we can express Equation (A4) in an error-correction format:

$$\Delta I_{it} = -\beta_2 \Delta I_{i,t-1} + \beta_3 \Delta S_{it} - \beta_5 \Delta S_{i,t-1} - (1 - \beta_1 - \beta_2)(I_{i,t-1} - S_{i,t-1}) + v_i + v_{jt} + v_t + e_{it} \qquad \text{(A5)}$$

where $(I_{i,t-1}-S_{i,t-1})$ represents the error-correction term. According to this equation, inventories are partially adjusted to current and past changes in sales, but in the long-run, they are kept approximately in line with sales. To be consistent with error-correction behavior, the coefficient associated with the ($I_{i,t-1}$ -$S_{i,t-1}$) term should be negative: if the stock of inventories moves further from (closer to) its desired level, future inventory investment should be higher (lower).

We further augment our model with a financial composition variable, *MIX*, which aim at picking up financial effects on inventory investment. This yields Equation (1) in the paper.

Appendix 2: Data

Structure of the unbalanced panel:

Number of obs. per firm	*Number of firms*	*Percent*	*Cumulative*
3	21	0.22	0.22
4	259	2.76	2.98
5	449	4.79	7.77
6	561	5.98	13.75
7	655	6.98	20.73
8	962	10.25	30.99
9	2212	23.58	54.57
10	4258	45.39	99.96
11	4	0.04	100.00
Total	9381	100.00	

Definitions of the variables used:

Inventories: includes finished goods and work-in-process inventories.

Sales: includes both UK and overseas turnover.

Total assets: the sum of the firm's fixed and current assets.

Export: dummy variable equal to 1 if the firm exports a positive amount, and 0 otherwise.

Foreign: dummy equal to 1 if the firm is foreign owned, and 0 otherwise. To be considered as foreign owned, the share of foreign ownership in a firm's equity must exceed 24.99%. This dummy variable is only available in the last year of observations available for each firm. We therefore assume that a firm which was foreign owned in its last available year was foreign owned throughout the period in which it was observed. Given the short sample that we analyze, this is a reasonable assumption. Actual data on the share of foreign ownership in a firm's equity are only available for a very limited number of observations.

MIX: ratio of short-term debt to short-term debt plus trade credit. Short-term debt includes the following items: bank overdrafts, short-term group and director loans, hire purchase, leasing, and other short-term loans, but it is predominantly bank finance.

CFTA: ratio of cash flow to tangible fixed assets. Cash flow is defined as the sum of profit/ loss for the period (after tax and interest) and depreciation.

Quiscore: indicator produced by *Qui Credit Assessment Ltd*, which measures the likelihood of company failure in the twelve months following the date of calculation. *Quiscore* is given as a number in the range from 0 to 100. The lower its *Quiscore*, the more risky a firm is likely to be. The indicator is constructed taking into account a number of factors, including the presence of any adverse documents appearing against the company on the public file, and the timeliness of getting the accounts filed. However, the most important factors relate to the financial performance of the company as evidenced by its balance sheet and profit and loss accounts. The key financial items used include turnover, pre-tax profits, working capital, intangibles, cash and bank deposits, creditors, bank loans and overdrafts, current assets, current liabilities, net assets, fixed assets, share capital, reserves and shareholders funds. The underlying economic conditions are also taken into account.

Deflators: all variables are deflated using the aggregate GDP deflator.

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Table 1: Summary statistics of the key variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Total	$CONS_{it}=1$	$CONS_{it}=0$	$CONS_{it}=1$	$CONS_{it}=0$	$CONS_{it}=1$	$CONS_{it}=0$	$CONS_{it}=1$	$CONS_{it}=0$	$GE_{it}=1$	$GE_{it}=0$	$GE_{it}=1$	$GE_{it}=0$
		$CONS_{it}=f(Sales_{it})$		$CONS_{it}=f(Employees_{it})$		$CONS_{it}=f(Age_{it})$		$CONS_{it}=f(Quiscore_{it})$		$GE_{it}=f(Export_{it})$		$GE_{it}=f(Foreign_{i})$	
Assets	39.5	6.16	139.8	10.114	138.16	27.4	76.9	37.8	46.3	45.8	26.9	55.7	45.9
(thousands)	(428)	(8.4)	(849.2)	(322.969)	(678.365)	(185.2)	(800.4)	(228.9)	(778.2)	(438.9)	(172.8)	(217.6)	(644.6)
Sales	47.9	8.7	165.8	12.925	165.348	36.3	83.7	49.7	44.1	54.5	34.5	72.9	49.8
(thousands)	(306.8)	(7.8)	(598.9)	(153.976)	(561.121)	(213.9)	(491.5)	(274.3)	(399.3)	(325.8)	(176.8)	(302.3)	(393.0)
Employees	388.5	110.2	1158.9	99.502	1261.092	302.9	640.1	408.1	335.0	424.0	284.7	465.8	452.8
	(2008.8)	(103.8)	(3790.5)	(75.296)	(3897.342)	(1504.6)	(3026.6)	(2021.8)	(2035.3)	(1873.8)	(958.4)	(1576.8)	(2735.2)
ΔI_{it}	-0.0101	-0.006	-0.0234	-0.011	-0.021	-0.0026	-0.0335	-0.0017	-0.0303	-0.0164	-0.0088	-0.0225	-0.0095
	(0.325)	(0.329)	(0.310)	(0.330)	(0.296)	(0.335)	(0.288)	(0.329)	(0.295)	(0.311)	(0.345)	(0.331)	(0.318)
ΔS_{it}	0.0008	-0.004	0.0160	-0.003	0.003	0.0077	-0.0207	0.0075	-0.0117	-0.008	0.016	-0.0033	0.00001
	(0.215)	(0.216)	(0.212)	(0.216)	(0.212)	(0.220)	(0.197)	(0.217)	(0.193)	(0.220)	(0.197)	(0.225)	(0.214)
$I_{i,t-1}-S_{i,t-1}$	-2.365	-2.378	-2.326	-2.353	-2.312	-2.401	-2.253	-2.359	-2.397	-2.180	-2.844	-2.248	-2.376
	(0.830)	(0.850)	(0.768)	(0.827)	(0.766)	(0.842)	(0.783)	(0.825)	(0.839)	(0.687)	(0.957)	(0.755)	(0.837)
MIX_{it}	0.506	0.493	0.5488	0.506	0.530	0.5058	0.510	0.534	0.407	0.517	0.485	0.592	0.495
	(0.270)	(0.266)	(0.278)	(0.269)	(0.273)	(0.2698)	(0.271)	(0.262)	(0.267)	(0.271)	(0.269)	(0.270)	(0.263)
$CFTA_{it}$	0.631	0.65	0.577	0.676	0.467	0.669	0.515	0.508	1.079	0.625	0.638	0.716	0.671
	(1.444)	(1.52)	(1.182)	(1.560)	(0.967)	(1.518)	(1.179)	(1.252)	(1.805)	(1.424)	(1.506)	(1.688)	(1.428)
$Quiscore_{it}$	55.03	55.03	55.04	55.043	54.954	53.98	58.26	45.43	84.73	55.07	54.07	55.73	54.54
	(21.89)	(22.04)	(21.44)	(21.98)	(21.668)	(21.79)	(21.90)	(15.29)	(8.41)	(22.13)	(21.15)	(23.43)	(21.46)
Age_{it}	30.57	28.18	37.74	28.512	39.092	19.21	65.58	29.37	34.86	32.04	28.37	29.69	33.14
	(24.03)	(21.97)	(28.19)	(22.040)	(28.708)	(10.77)	(19.38)	(23.35)	(25.71)	(24.6)	(23.22)	(24.55)	(24.83)
$Export_{it}$	0.744	0.712	0.832	0.446	0.520	0.730	0.786	0.740	0.758			0.841	0.727
	(0.436)	(0.453)	(0.373)	(0.497)	(0.50)	(0.444)	(0.410)	(0.439)	(0.428)			(0.365)	(0.445)
$Foreign_{i}$	0.462	0.414	0.569	0.735	0.823	0.473	0.431	0.447	0.505	0.500	0.334		
	(0.499)	(0.493)	(0.496)	(0.441)	(0.382)	(0.499)	(0.495)	(0.497)	(0.500)	(0.500)	(0.472)		
Observations	40949	30735	10214	28469	9460	30914	10030	30161	9755	21766	7471	14083	16399

Notes: The Table reports sample means. Standard deviations are presented in parentheses. The subscript *i* indexes firms, and the subscript *t*, time, where *t*=1993-2003. *I*: logarithm of inventories; *S*: logarithms of sales; *MIX*: ratio of short-term debt to short-term debt plus trade credit; *CFTA*: ratio of cash flow to tangible fixed assets; *Quiscore*: indicator which measures the likelihood of company failure in the twelve months following the date of calculation. The lower its *Quiscore* value, the more risky the firm is likely to be. *Export*: dummy variable equal to 1 if the firm exports a positive amount, and 0 otherwise. *Foreign*: dummy equal to 1 if the firm is foreign owned, and 0 otherwise. The dummy variable $CONS_{it}$ takes value 1 for firm *i* in year *t* if firm *i*'s sales (columns 2-3), number of employees (columns 4 and 5), age (columns 6 and 7), or *Quiscore* (columns 8 and 9) are respectively in the bottom three quartiles of the distribution of the sales, number of employees, age, or *Quiscore* of all the firms in firm *i*'s industry in year *t*, and 0 otherwise. GE_{it} is a dummy variable equal to 1 if firm *i* has positive exports in year *t* and/or is foreign owned in year *t*, and 0 otherwise.

Table 2: Inventory investment and financial variables

	(1)	(2)
ΔI_{it-1}	-0.084***	-0.056**
	(0.020)	(0.024)
ΔS_{it}	0.801***	0.902***
	(0.178)	(0.172)
$\Delta S_{i,t-1}$	0.040***	0.033*
	(0.013)	(0.020)
$I_{i,\,t-1} - S_{i,\,t-1}$	-0.506***	-0.661***
	(0.053)	(0.085)
MIX_{it}	0.191***	0.327***
	(0.058)	(0.097)
$CFTA_{it}$		-0.015
		(0.011)
Observations	40417	35783
Number of firms	9289	7710
m1 (p)	0.00	0.00
m2 (p)	0.57	0.61
Sargan (p)	0.19	0.81

Notes: All specifications were estimated using a GMM first-difference specification. Test statistics and standard errors (in parentheses) are asymptotically robust to heteroskedasticity. *m1 (m2)* is a test for first- (second-) order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The *J* statistic is a test of the overidentifying restrictions, distributed as chi-square under the null of instrument validity. Instruments include $\Delta I_{i,t-2}$; $\Delta S_{i,t-2}$; $(I_{i,t-2} - S_{i,t-2})$; $MIX_{i,t-2}$; $CFTA_{i,t-2}$ (in column 2 only); and further lags. Time dummies and time dummies interacted with industry dummies were always included as regressors and as instruments. Also see Notes to Table 1. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level.

Table 3: Inventory investment and *MIX*: distinguishing firm-years on the basis of whether they are more or less likely to face financial constraints in a traditional sense

	(1)	(2)	(3)	(4)
	$CONS_{it}$ = $f\,(Sales_{it})$	$CONS_{it}$ = $f\,(Employees_{it})$	$CONS_{it}$ = $f\,(Age_{it})$	$CONS_{it}$ = $f\,(Quiscore_{it})$
ΔI_{it-1}	-0.061***	-0.093***	-0.079***	-0.059***
	(0.023)	(0.020)	(0.017)	(0.018)
ΔS_{it}	0.501**	0.826***	0.779***	0.549***
	(0.224)	(0.168)	(0.146)	(0.161)
$\Delta S_{i,t-1}$	0.034**	0.041***	0.038***	0.028**
	(0.015)	(0.013)	(0.013)	(0.013)
$I_{i,\,t-1} - S_{i,\,t-1}$	-0.425***	-0.498***	-0.511***	-0.473***
	(0.059)	(0.066)	(0.050)	(0.055)
MIX_{it}*$CONS_{it}$	0.349**	0.205**	0.243***	0.145**
	(0.163)	(0.094)	(0.090)	(0.059)
MIX_{it}*(1-$CONS_{it}$)	-0.379	0.140	0.035	0.187
	(0.348)	(0.215)	(0.174)	(0.141)
Observations	40417	37452	40412	39113
Number of firms	9289	8681	9288	9086
m1 (p)	0.00	0.00	0.00	0.00
m2 (p)	0.71	0.56	0.57	0.65
Sargan (p)	0.27	0.18	0.23	0.29

Notes: The dummy variable $CONS_{it}$ takes value 1 for firm *i* in year *t* if firm *i*'s sales (column 1), number of employees (column 2), age (column 3), or *Quiscore* (column 4) are respectively in the bottom three quartiles of the distribution of the sales, number of employees, age, or *Quiscore* of all the firms in firm *i*'s industry in year *t*, and 0 otherwise. Instruments include $\Delta I_{i,t-2}$; $\Delta S_{i,t-2}$; ($I_{i,t-2}$ - $S_{i,t-2}$); $MIX_{i,t-2}$; $Sales_{i,t-2}$ / $Employees_{i,t-2}$ / $Age_{i,t-2}$ / $Quiscore_{i,t-2}$ and further lags. Time dummies and time dummies interacted with industry dummies were always included as regressors and as instruments. Also see Notes to Tables 1 and 2. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively.

Table 4: Inventory investment and *MIX*: distinguishing firm-years on the basis of their global engagement status

	(1)	(2)
	$GE_{it} = f\,(Export_{it})$	$GE_{it} = f\,(Foreign_{i})$
ΔI_{it-1}	-0.054**	-0.073***
	(0.021)	(0.018)
ΔS_{it}	0.771***	0.717***
	(0.163)	(0.147)
$\Delta S_{i,t-1}$	0.028*	0.036***
	(0.015)	(0.014)
$I_{i,\,t-1} - S_{i,\,t-1}$	-0.553***	-0.496***
	(0.059)	(0.056)
$MIX_{it}*(1-GE_{it})$	0.468***	0.229**
	(0.149)	(0.115)
$MIX_{it}*GE_{it}$	0.040	0.107
	(0.081)	(0.104)
Observations	26921	30064
Number of firms	6927	6605
m1 (p)	0.00	0.00
m2 (p)	0.85	0.29
Sargan (p)	0.19	0.15

Notes: GE_{it} is a dummy variable equal to 1 if firm *i* has positive exports in year *t* (column 1) and/or is foreign owned in year *t* (column 2), and 0 otherwise. Instruments include $\Delta I_{i,t-2}$; $\Delta S_{i,t-2}$; $(I_{i,t-2} - S_{i,t-2})$; $MIX_{i,t-2}$; $Export_{i,t-2}$ / $Foreign_i$ and further lags. Time dummies and time dummies interacted with industry dummies were always included as regressors and as instruments. Also see Notes to Tables 1 and 2. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively.

Table 5: Inventory investment and *MIX*: distinguishing firm-years on the basis of whether they are more or less likely to face financial constraints in a traditional sense, and on the basis of their degree of global engagement measured in terms of export behavior

	(1)	(2)	(3)	(4)
	$CONS_{it} = f\,(Sales_{it})$ $GE_{it} = f\,(Export_{it})$	$CONS_{it}=f(Employees_{it})$ $GE_{it} = f\,(Export_{it})$	$CONS_{it} = f\,(Age_{it})$ $GE_{it} = f\,(Export_{it})$	$CONS_{it}=f(Quiscore_{it})$ $GE_{it} = f\,(Export_{it})$
ΔI_{it-1}	-0.050**	-0.055**	-0.056***	-0.042**
	(0.020)	(0.022)	(0.019)	(0.018)
ΔS_{it}	0.672***	0.615***	0.787***	0.695***
	(0.148)	(0.163)	(0.142)	(0.129)
$\Delta S_{i,t-1}$	0.030**	0.031**	0.029*	0.022
	(0.015)	(0.016)	(0.015)	(0.015)
$I_{i,\,t-1} – S_{i,\,t-1}$	-0.509***	-0.474***	-0.551***	-0.553***
	(0.055)	(0.071)	(0.056)	(0.056)
MIX_{it}*$CONS_{it}$*$(1\text{-}GE_{it})$	0.378**	0.466**	0.478***	0.447***
	(0.188)	(0.189)	(0.180)	(0.151)
MIX_{it}*$CONS_{it}$*GE_{it}	0.005	0.014	0.075	0.041
	(0.129)	(0.145)	(0.104)	(0.076)
MIX_{it}*$(1\text{-}CONS_{it})$	0.113	0.096	0.041	0.209
	(0.211)	(0.276)	(0.197)	(0.128)
Observations	26921	26047	26916	25840
Number of firms	6927	6688	6926	6726
m1 (p)	0.00	0.00	0.00	0.0
m2 (p)	0.93	0.88	0.84	0.92
Sargan (p)	0.33	0.60	0.22	0.14

Notes: $CONS_{it}$ takes value 1 for firm *i* in year *t* if firm *i*'s sales (column 1), number of employees (column 2), age (column 3), or *Quiscore* (column 4) are respectively in the bottom three quartiles of the distribution of the sales, number of employees, age, or *Quiscore* of all the firms in firm *i*'s industry in year *t*, and 0 otherwise. GE_{it} is a dummy variable equal to 1 if firm *i* has positive exports in year *t*, and 0 otherwise. Instruments include $\Delta I_{i,t-2}$; $\Delta S_{i,t-2}$; $(I_{i,t-2} - S_{i,t-2})$; $MIX_{i,t-2}$; $Sales_{i,t-2}$ / $Employees_{i,t-2}$ / $Age_{i,t-2}$ / $Quiscore_{i,t-2}$; $Export_{i,t-2}$ and further lags. Time dummies and time dummies interacted with industry dummies were always included as regressors and as instruments. Also see Notes to Tables 1 and 2. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.